1.0 Introduction

The City of Carlsbad has conducted Dry Weather Analytical Monitoring for several years. The Dry Weather Monitoring Program outlined below is the result of years of experience conducting this program. The program has been modified to meet or exceed the requirements of the Permit while taking into account what has been learned about the system.

Overall, the objective of this program is to detect and eliminate illicit connections and illegal discharges (IC/IDs) in order to minimize the negative impacts on receiving water bodies. Illicit connections and illegal discharges have the potential to transport large amounts of various pollutants to MS4s through storm water runoff and non-storm water discharges. The Permit requires that all Copermittees establish an Illicit Discharge Detection and Elimination Component to actively seek and eliminate contaminated discharges to the MS4.

In order to determine specifically what types of discharges are prohibited, the City has established discharge prohibitions, non-storm water discharge exemptions (allowable discharges), and a process for evaluating non-storm water discharge exemptions. IC/IDs can be defined as the following:

An ***illicit connection*** as defined in Order R9-2007-0001 is any connection to the MS4 that conveys an illicit discharge.

An ***illegal discharge*** is the act of disposing of any pollutant to the MS4 that is prohibited by the City of Carlsbad. Illegal discharges may consist of wash water, sediment, spilled chemicals, sewage infiltration, and other pollutants entering the MS4 either intentionally or unintentionally, and all contribute to the degradation of local water quality.

A critical method of IC/ID detection is dry weather analytical and field screening monitoring. The Permit requires each Copermittee to complete the following tasks in developing a Dry Weather Analytical and Field Screening Monitoring Program:

- Select dry weather field screening and analytical monitoring stations
- Complete an MS4 map
- Develop dry weather field screening and analytical procedures
- Conduct dry weather field screening and analytical monitoring.

The City will use dry weather field and analytical monitoring information to characterize dry weather discharges in the MS4 and identify conveyances that are discharging elevated levels of pollutants. Follow-up studies and source investigations will be conducted as required, to detect and eliminate the sources of these pollutants.
There are three components to the dry weather-monitoring program:

1. Field observations
2. Field screening
3. Laboratory analyses.

Field observations include various site descriptions and a series of qualitative (mainly visual) observations of physical and biological conditions at the site. Field screening includes determinations of several water quality parameters and flow in the field. The laboratory analysis component involves the collection of samples for a more extensive laboratory analysis of pollutants that can cause water quality degradation. The presence of abnormal conditions in any

of the three dry weather-monitoring components is justification for initiating a pollutant source identification investigation.

2.0 Selection of Sampling Locations

The City of Carlsbad has identified 60 primary monitoring stations where data will be collected during the dry weather analytical and field screening-monitoring program. Additionally, 14 alternate stations have been identified that will be monitored if any of the primary stations exhibit no flow. The selected primary and alternate monitoring stations, their locations, land-use and drainage areas are presented in Tables 8-1 and 8-2, respectively at the end of this section. More specific information, including a complete map of the MS4 system, primary and alternate sampling station locations, and drainage basins, is included as Appendix 8-1. Dry weather monitoring stations were selected non-randomly to provide adequate coverage of the MS4 by considering the following criteria:

- Previously detected or suspected pollution problem areas
- Location in drainage area
- Hydrologic conditions, including total drainage area of the site
- Traffic density
- Age of structures and buildings in the area
- History of the area
- Land use
- Accessibility, Safety

Sampling Frequencies

Dry weather field screening and analytical monitoring will be conducted at each primary sampling station at least once during the dry season (May 1 – September 30).

Sampling Conditions

Monitoring will not be conducted within 72 hours after any rain event or if local hydrologic conditions indicate that storm flow is still occurring at a site after a rain event. Grab samples will be collected for field analysis at each station where there is ponded or flowing water. An additional set of grab samples will be collected for laboratory analysis at a minimum of 25% of the sites where ponded or flowing water is observed.

Sampling Procedures

Field screening and analytical sampling will be conducted according to the procedures outlined in the Dry Weather Monitoring Sampling Manual (Appendix F). Field personnel will have a copy of these procedures during all storm water field operations. Additional field reference materials will be available at all times including MS4 maps, contact numbers, and field equipment operating manuals and procedures.

Field Screening and Laboratory Analytical Monitoring

All field screening and laboratory analytical monitoring results will be recorded on a Dry Weather Storm Drain Monitoring Data and Observation Sheet (Form 8-1) and follow the procedures given below:

2.1 Field Screening

Field screening will consist of a series of qualitative field observations, flow measurement, and field analyses of selected water quality parameters. Information relating to weather conditions, the amount of time since last rainfall or storm discharge, and the type of storm water conveyance

will also be recorded. Specific observations and results of the field water quality analyses will be recorded on the field data sheet. The data sheet will also serve as a record of the field visit and will be completed for every site visit regardless of whether samples are collected. Laboratory analytical monitoring results will be recorded on the data sheet at a later date, which will be submitted to the RWQCB as part of the dry weather monitoring report for the City of Carlsbad.

a. Qualitative Observations

Qualitative field observations will be made during each site visit whether or not ponded or flowing water is observed. These observations are intended to provide a general assessment of the site and include parameters like odor, water clarity, the presence of floatables, visible deposits, stains, and biological status. Evidence of present or past illicit connections and illegal discharges to the MS4 may be ascertained by careful field observations. Each field screening location will be photographed to provide additional information and documentation of site conditions.

b. Flow Measurement

Flow measurements will be used to estimate pollutant mass loading, prioritize storm drains for future investigation, and identify significant changes in discharge that may be indicative of an illegal release upstream. Field methods will be employed to estimate discharge rates, as described in Form 8-2.

c. Field water quality analyses

At each site with ponded or flowing water, grab samples will be collected and analyzed in the field for the following constituents:

- Specific conductance (calculate estimated Total Dissolved Solids)
- Turbidity
- pH
- Reactive Phosphorus (Ortho-P)
- Nitrate-N
- Ammonia-N
- Surfactants (MBAS)*
- Temperature

* Due to the importance of surfactants, the City will test this parameter both in field and laboratory analyses.

Analytical Monitoring

At a minimum of 25% of the sites where ponded or flowing water is observed, grab samples will be collected and submitted to a California Department of Health Services certified laboratory for analysis of the following constituents using the standard methods presented in Table 8-3:

- Total Hardness
- Oil and Grease
- Diazinon and Chlorpyrifos
- Cadmium (Dissolved)
- Lead (Dissolved)
- Zinc (Dissolved)

- Copper (Dissolved)
- Enterococcus bacteria
- Total Coliform bacteria
- Fecal Coliform bacteria
- Surfactants (MBAS)

Reporting

Beginning May 1, 2008, the City will begin conducting dry weather analytical and field screening monitoring in accordance with the procedures outlined above. The City will collect data during the period of May 1 – September 30 each year and report the results of the dry weather monitoring annually.

2.2 IC/ID Identification

The City of Carlsbad will utilize the following three mechanisms to identify illicit connections and illegal discharges to municipal MS4s:

- Dry Weather Analytical and Field Screening Monitoring
- Public complaints and referrals
- Inspections of businesses and municipal facilities

Dry Weather Analytical and Field Screening Monitoring

As described above, the City will implement a Dry Weather Analytical and Field Screening Monitoring program to detect IC/IDs in the MS4. Dry weather field screening and analytical monitoring information will be used to characterize dry weather discharges in the MS4 and identify conveyances that are discharging elevated levels of pollutants. Based on results obtained from the program, investigations may be required to identify and eliminate the source of specific pollutants that exceed accepted action level concentrations (Table 8-4).

TABLE 1: PRIMARY DRY WEATHER MONITORING STATIONS

Agua Hedionda Lagoon Watershed			
Site Number	**Location**	**Description**	**Land Use**
AH03	East of railroad track, southwest of Maya Street.	72” RCP	Residential
AH08	Agua Hedionda Lagoon at Encinas Power Plant, east of Encinas Plant Tower	96” RCP	Industrial Commercial
AH 09	Behind 5115 Building Avenida Encinas	Manhole 36”RCP	Commercial
AH10	West of Avenida Encinas, near Manzano/El Arbol intersection, near railroad tracks	2-60” RCP	Commercial
AH11	Main line east of I-5, south of Cannon Road, west of the Car Country Carlsbad Sign	36” RCP	Commercial
AH12	Concrete channel east of I-5, west of the Dixon Ford parking lot off Paseo Del Norte	36”RCP	Commercial
AH13	Concrete channel west of Paseo del Norte, approximately 250 feet north of Pea Soup Anderson’s	2-48” RCP	Commercial

Agua Hedionda Lagoon Watershed			
Site Number	**Location**	**Description**	**Land Use**
AH18	South of the Park Drive and Valencia Avenue Intersection	39” RCP	Residential
AH24	Kelly and Park Drive Intersection	Concrete channel	Residential
AH27	Between Pontiac Avenue and La Portalada Drive, north of Tamarack	Concrete channel	Residential
AH28	50 yards east of the La Portalada Drive and Tamarack Avenue intersection, on the north side of Tamarack Ave.	2-60” RCP	Residential
AH30	East of Sierra Morena Avenue, south of Valewood	60”RCP	Residential
AH31	South of Chestnut, east of Sierra Morena Avenue	48” RCP	Residential
AH32	Intersection of Don Arturo and Don Porifirio Drive (in gated community)	Earthen and Concrete Channel	Residential
AH45	500 feet from the south Van Allen Way cul-de-sac, north east of the pond	84” RCP	Commercial
AH46	Outfall located at the north of the horse stable on Sunny Creek Rd	60”RCP	Industrial/Commercial
AH59	Sedimentation basin, approximately 1200 feet north of El Fuerte Street	48” RCP	Commercial
AH61	Northeast of 2875 Loker Avenue	Manhole, 36” RCP	Industrial
AH63*	Tamarack Ave., Hillside Dr., Park Dr., south of Calavo Ct., in east sidewalk	Manhole	Residential
AH65*	Tamarack Ave., Pontiac Dr., across from Southampton Rd.	Manhole	Residential

Batiquitos Lagoon (San Marcos Creek) Watershed			
Site Number	**Location**	**Description**	**Land Use**
BA02	Down in the sediment basin at the southwest corner of Navigator Cir. and Windrose Cir	36” RCP	Residential
BA03	End of Gabbiano on Batiquitos Lagoon Trail	72” RCP	Residential
BA04	In front of 7017 Nutmeg Avenue	Manhole, 42” RCP	Residential
BA06	Batiquitos Drive, midway between Poinsettia Lane and Daisy Avenue	Manhole, 36” RCP	Residential
BA07	Northeast of the intersection of Buttercup Road and Seascape Drive	Manhole, 54”RCP	Residential
BA13	Debris basin outlet to Batiquitos Lagoon, southwest of El Camino Real and Arenal Intersection	60” RCP	Residential
BA26	Between 2526 and 2532 Unicornio Street	Manhole, 42” RCP	Residential
BA27	100 feet into the canyon near the El Fuerte and Chorlito Intersection	42” CMP	Residential
BA32	In front of 2927 Luciernaga Street	Manhole, 42” RCP	Residential
BA34	South of Vista Mariana, in La Costa Golf Course	48” RCP	Residential
BA36	Southeast corner of La Costa Golf Course behind 7525 Gibraltar Street near Round Tree Apartments	48” RCP	Residential
BA40	30 feet southwest of the Melrose Drive and Rancho Santa Fe Road intersection	72” RCP	Commercial/Residential
BA41	(Northern edge) La Costa Canyon Park, in canyon; across from 3015 Pueblo Street	Manhole, 54” RCP	Residential
BA43	30 yards north of the El Camino Real and Levante Street intersection	60” CMP	Residential
BA47	Rancho Santa Fe Blvd. and Camino Alvaro intersection	Manhole	Residential
BA48	500 feet south of the intersection of Camino De Los Coches and Rancho Sante Fe Road	Outfall, 36” RCP	Residential
BA49	Northwest of Batiquitos Lagoon, east of Carlsbad Blvd	Manhole, 72”-81” RCP	Residential
BA51*	Alga Rd., east of El Camino Real, between 2035 and 2043	3 x 84” RCP	Residential
BA52*	Batiquitos Dr., east of Golden Star Lane, north of street inside detention basin	48” RCP	Residential

Buena Vista Lagoon Watershed			
Site Number	**Location**	**Description**	**Land Use**
BV02	East side of State St., south of the Carlsbad Blvd. and State St. intersection	2-48” RCP	Commercial
BV04A	East of Buena Vista Lagoon Ecological Reserve, on the east bank	Outfall, 27” RCP	Commercial
BV06	50 feet west of the S. Vista Way Bridge on the south side of Buena Vista Creek	Outfall 51” RCP	Commercial
BV09	50 yards north of the El Camino Real and Carlsbad Village Drive intersection on the center divider	Manhole	Commercial/ Residential
BV10	Southwest corner of the Carlsbad Village Drive and El Camino Real intersection	18” CMP	Residential
BV15*	Laguna Dr. and State St. intersection, across from 2531 State St.	Manhole	Commercial Industrial
BV16*	Marron Rd. Monroe St. intersection, across from The Olive Garden Restaurant	Manhole	Residential

ENCINAS CREEK WATERSHED			
Site Number	**Location**	**Description**	**Land Use**
EN02A	West of 6030 Avenida Encinas east of the Rail Road tracks	Earthen Channel	Industrial/ Commercial
EN02A-1	Behind 5600 Avenida Encinas near railroad tracks	Concrete Channel	Industrial/ Commercial
EN02B	Inside Encinas Wastewater Plant	Open Channel	Commercial
EN02C	North bank of Encinas Creek, underneath I-5 overpass. Access through Wastewater Plant	39” RCP	Commercial
EN09	Encinas Creek, south of Palomar Airport Road, on Laurel Tree Road	4-48” CMP	Commercial
EN14	Corner of Palomar Oaks Way and Camino Vida Roble, near 1911 Palomar Oaks Way	Manhole, 42” RCP	Commercial
EN14A	30 yards west of 1911 Palomar Oaks Way, in the canyon	48” RCP	Commercial
EN18	Behind 1979 Palomar Oaks Way	48” RCP	Commercial
EN19	Beside 1949 Palomar Oaks Way	Concrete Channel	Commercial
EN20	Across from 1979 Palomar Oaks Way	48” RCP	Commercial
EN21	Camino Vida Roble, midway between Palomar Airport Road and Owens Avenue	Manhole	Commercial
EN23	Northwest corner of Yarrow Drive and Camino Vida Roble intersection	5’x10’ RCB	Commercial
EN24	Between 2225 and 2265 Camino Vida Roble, in front of the Post Office	24” RCP	Industrial/ Commercial
EN31	10 yards north of 1925 Palomar Oaks Way, in the canyon	24” RCP	Industrial/ Commercial

TABLE 2: ALTERNATE DRY WEATHER MONITORING STATIONS

Site Number	Location	Description	Land Use
AH26	200 feet northeast of the Camino Real and Kelly Drive intersection	4.5 Feet Earthen Channel	Commercial/ Residential
AH28A	50 yards east of the La Portalada Drive and Tamarack Avenue intersection, on the north side of Tamarack Ave.	8'x5' RCB	Residential
AH56	In front of 2251 Faraday Avenue	Manhole	Commercial
AH64*	Kelly Dr. and Hillside Dr., intersection in front of 4870, on the sidewalk	Manhole	Residential School
AH66*	El Camino Real across from Cannon Rd., in Parkway Nursery Road, behind Rancho Carlsbad Community	Open Channel	Residential Open space
AH67*	Rutherford Rd. and Aston Ave. intersection, close to the sidewalk	Manhole	Planned Industrial
BA31	Behind 7490 and 7497 Via de Fortuna, inside gated community	72" RCP	Residential
BA50*	La Costa Ave., between Romeria St. and Cadencia St. in front of 3105	Grated catch basin	Residential
BA 53*	Batiquitos Dr., northeast corner of Batiquitos Dr. and Aviara Dr., intersection, inside detention basin	48" RCP	Residential
BV08	South bank of Buena Vista Creek, ten yards west of El Camino Real	66" RCP	Commercial/ Residential
BV14	10 yards west of the Concord and Vancouver Street intersection, northwest side	Manhole, 36" RCP	Residential
EN13	Behind 5860 Dryden Lane, inside Callaway Test Center	36" RCP	Commercial
EN16	Southeast of the intersection of Palomar Airport Road and Palomar Oaks Way	Open Channel	Commercial
EN32*	Palomar Airport Rd., Paseo Del Norte, Camino Del Parque, Caminito Del Sol, in front of 801-802	Manhole	Residential

TABLE 3 SUMMARY OF LABORATORY SAMPLING AND ANALYSIS METHODS

Physical and Inorganic Non-Metals	**Analytical Method**	**Container**	**Volume (mL)**	**Preservative (Always @ 4° C)**	**Holding Time**
TDS	SM 2540C	P	100		7 d
TSS	SM 2540D	P	100		7 d
Turbidity	SM 2130A	P	100		48 h
Alkalinity or Hardness	SM 2320B	P	100		14 d
pH	EPA 150.1	P	10		Field
Conductivity	SM2510B	P	20		28 d
Temperature		N/A			Field
Phosphorous, total	SM4500PE	P	100	H_2SO_4	28 d
Phosphorous, dissolved / reactive	SM4500PE	P	100	H_2SO_4	48 h
Nitrate	SM 4500 NO3 E	P	100		48 h
Nitrite	SM 4500 NO2 B	P	100		48 h
TKN	EPA 351.1	P	200		28 d
Ammonia	SM4500 NH3 D	P	500	H_2SO_4	28 d
BOD	EPA 405.1	P	1000		48 h
COD	EPA 410.4	P	10	H_2SO_4	28 d
Chlorine, Residual	SM4500 Cl G	N/A			Field
Organics					
*Petroleum Hydrocarbons, total (d + g)	EPA 8015	G + 2V	250 + 40 (2)	HCl	14 d
Oil and Grease	EPA 413.1	G	500	HCl	14 d
Diazinon	EPA 8140	G	1000		7 d
Chlorpyrifos	EPA 8140				
Methylene Blue Substances (MBAS)	SM 5540 C	P	250		48 h
Organochlorine Pesticides and PCBs	EPA 8081, 8082	G	1000		7 d
*Volatile Organic Compounds	EPA 8260	2V	40 (2)	HCl	14 d
Semivolatile Organic Compounds	EPA 8270	G	1000		7 d
Metals / Toxics					
Antimony	EPA 6010	P	500	HNO_3	6 m
Arsenic	EPA 6020	P			
Cadmium	EPA 6010	P			
Chromium	EPA 6010	P			
Copper	EPA 6010	P			
Lead	EPA 6010	P			
Nickel	EPA 6010	P			
Zinc	EPA 6010	P			
Thallium	EPA 7470	P			
Silver	EPA 6020	P			
Mercury	EPA 6010	P			28 d
Cyanide	SM 4500 CN C	P	500	NaOH	14 d
Phenols (from SVOC's)	EPA 8270	G	1000		7 d
Bacteriological (including dilutions)					
Coliform, total	SM 9221	P (sterile)	125	$Na_2S_2O_3$	6 h
Coliform, fecal	SM 9221	P (sterile)			
Coliform, *E Coli*		P (sterile)	125		
Enterococcus	SM 9230	P (sterile)	125		
Streptococcus	SM 9230	P (sterile)			

*ZHS (Zero Head Space Required) V=VOA / G=Amber Glass / P=Plastic

TABLE 4 ACTION LEVELS FOR FIELD SCREENING AND LABORATORY PARAMETERS

Field Screening Analytes	Action Levels[1]	Source/ Notes
pH	<6.5 or >9.0	Basin Plan, w/ allowance for elevated pH due to excessive photosynthesis. Elevated pH is especially problematic in combination with ammonia.
orthophosphate-P (mg/L)	2.0	USEPA Multi-sector General Permit
nitrate-N (mg/L)	10.0	Basin Plan, and drinking water standards
Ammonia-N (mg/L)	1.0	Based on Workgroup experience. May also consider unionized ammonia fraction
Turbidity (NTU)[2]	Best Professional Judgment	WQOs relevant to inland surface waters are not available. Base judgment on channel type and bottom, since last rain, backgroun levels, and most importantly visual observation (e.g. unusual colors and lack of clarity), and unusual odors.
Temperature (^{o}F or C)	Best Professional Judgment	Base judgment on season, air temperature, channel type, shading, etc.
Conductivity (umhos/cm) or TDS (mg/L)	Best Professional Judgment	Values > 5,000 umhos/cm may indicate IC/ID however; EC may be highly elevated in some regions due to high TDS groundwater exfiltration to surface water, mineral dissolution, drought, and seawater intrusion. Normal source ID and discharge elimination works is not effective in these situations. Knowledge of area background conditions is important. Values <750 may indicate excessive potable water discharge or flushing.

Laboratory Analytes	Action Levels	Source/ Notes
MBAS (mg/L)	1.0	Basin Plan, w/ allowance based on Workgroup field experience and possible field reagent interferences
Oil and Grease (mg/L)	15	USEPA Multi-sector General Permit. If a petroleum sheen is observed, the sample should be collected from the water surface. Visual observations may justify immediate investigation.
Diazinon (ug/L)	*0.5*	Response to diazinon and chlorpyrifos levels above 0.5 µg/L should focus on education and outreach to potential dischargers in the target drainage basin. Highly elevated levels should be investigated aggressively as with other potential IC/Ids.
Chlorpyrifos (ug/L)	*0.5*	
Dissolved Cadmium (ug/L)	*California Toxics Rule*	Use California Toxics Rule, 1-hour criteria to determine appropriate action level for individual samples. Table provides benchmarks based on hardness and dissolved metals concentration. For example, at 300 mg/L hardness, the following action levels would apply: Cd – 14 ppb; CU – 38 ppb; Pb – 209 ppb; and Zn – 297 ppb.
Dissolved Copper (ug/L)	*California Toxics Rule*	
Dissolved Lead (ug/L)	*California Toxics Rule*	
Dissolved Zinc (ug/L)	*California Toxicx Rule*	
Total Coliform (MPN/ 100 mls)	*50,000*	Action levels are based on upper 90% confidence level of Copermittees 2002 dry weather analytical monitoring data.
Fecal Coliform (MPN/ 100 mls)	*20,000*	
Enterococcus (MPN/ 100 mls)	*10,000*	

[1]The referenced action levels should not be the sole criteria for initiating a source identification investigation. Dry weather monitoring data should be interpreted using a variety of available information. Factors that should be considered include within-site and between-site sample variability.

[3] The statistical outlier test uses the mean and standard deviation of a dry weather data set to determine whether a sample concentration exceeds a given confidence interval (usually 90 or 95%). Those readings that are above the confidence interval **and** exceed the referenced guidelines are identified as outliers and are appropriate for source identification.

City of Carlsbad
Dry Weather Monitoring Field Datasheet

☐ **Routine Investigation** ☐ **IC/ID Follow-Up For** _____

GENERAL SITE DESCRIPTION (NAD 83 decimal degrees to 5th place)

Site ID			**Latitude**		**Watershed**	**Hydrologic Unit**	
Location			**Longitude**			**Hydrologic Area**	
			TB Page			**Hydrologic Subarea** (Optional)	
Date		**Time**		**Observer**		**Discharge Area** (Optional)	

Land Use (Primary) ☐ Residential ☐ Commercial ☐ Industrial ☐ Agricultural ☐ Parks ☐ Open

Land Use (Secondary) ☐ Residential ☐ Commercial ☐ Industrial ☐ Agricultural ☐ Parks ☐ Open

Conveyance ☐ Manhole ☐ Catch Basin ☐ Outlet ☐ Concrete Channel ☐ Natural Creek ☐ Earthen Channel

ATMOSPHERIC CONDITIONS

Weather ☐ Sunny ☐ Partly Cloudy ☐ Overcast ☐ Fog
Tide ☐ N/A ☐ Low ☐ Incoming ☐ High ☐ Outgoing **Tide Height:**_____ft.
Last Rain ☐ > 72 hours ☐ < 72 hours
Rainfall ☐ None ☐ < 0.1" ☐ > 0.1"

RUNOFF CHARACTERISTICS

Odor	☐ None	☐ Musty	☐ Rotten Eggs	☐ Chemical	☐ Sewage	☐ Other _____
Color	☐ None	☐ Yellow	☐ Brown	☐ White	☐ Gray	☐ Other _____
Clarity	☐ Clear		☐ Slightly Cloudy	☐ Opaque		☐ Other _____
Floatables	☐ None	☐ Trash	☐ Bubbles/Foam	☐ Sheen	☐ Fecal Matter	☐ Other
Deposits	☐ None	☐ Coarse Particulate	☐ Fine Particulates	☐ Coarse & Fine	☐ Stains ☐ Oily Deposit	☐ Other
Vegetation	☐ None	☐ Limited	☐ Normal	☐ Excessive		☐ Other _____
Biology	☐ None	☐ Insects	☐ Algae	☐ Snails/Fish	☐ Mussels/Barnacles	☐ Other _____

Flow Observed ☐Yes ☐ No ☐ Ponded ☐ Tidal

Does the storm drain flow reach the Receiving Water? ☐ Yes ☐ No ☐ N/A

Evidence of Overland Flow? ☐ Yes ☐ No ☐ Irrigation Runoff ☐ Other: _____

Photo Taken ☐ Yes ☐ No **Photo #** _____

Field Screening Samples Collected? ☐ Yes ☐ No

Water Temp (°C)		**NH_3-N** (mg/L)		**NO_3** (mg/L)		**Ortho -PO_4** (mg/L)	
pH (pH units)		**MBAS** (mg/L)		**NO_3-N** (mg/L)		Ortho –PO4-P(mg/L)	
COND (mS/cm)		**TURB** (NTU)		**Other**			

Analytical Lab Samples Collected? ☐ Yes ☐ No

FLOW ESTIMATION WORKSHEETS

Flowing Creek or Box Culvert

Width		in
Depth		in
Velocity		ft/sec
Flow		gpm

Filling a Bottle or Known Volume

Volume		mL
Time to Fill		sec
Flow		gpm

Flowing Pipe

Diameter		ft
Depth		ft
Velocity		ft/sec
Flow		gpm

COMMENTS: _____

San Diego Stormwater Copermittees

Land Use Types for Dry Weather Monitoring

(Adopted by the Dry Weather Monitoring Workgroup, April 20, 2004)

1. **Residential**

   Residential (general)
   Single- and multi-family homes, mobile home parks, etc.

   Rural residential (For the County of San Diego and other appropriate Copermittees)
   Single family homes located in rural areas with lot sizes of approximately 1 to 10 acres. Rural residential estates may have small orchards, fields or small storage buildings associated with the residential dwelling unit, etc.

2. **Commercial**

   Offices, schools, shopping centers, auto dealerships, government/civic centers, cemeteries, churches, libraries, post offices, fire/police stations, military use, jails, prisons, border patrol holding stations, dormitories, hotels, motels, resorts, and casinos, etc.

3. **Agricultural**

   Orchards, vineyards, nurseries, greenhouses, flower fields, dairies, livestock, poultry, equine ranches, row crops and grains, pasture, fallow, etc.

4. **Industrial**

   Shipbuilding, airframe, aircraft manufacturing, industrial parks, manufacturing uses such as lumber, furniture, paper, rubber, stone, clay, and glass; auto repair services/recycling centers; warehousing, wholesale trade; mining, sand and gravel extraction, salt evaporation; junkyard, dumps/landfills; auto wrecking/dismantling and recycling centers, etc.

5. **Parks**

   Recreation areas and centers, neighborhood parks, wildlife and nature preserves, golf courses, accessible sandy areas along the coast or major water bodies allowing swimming and picnicking, etc.

6. **Open**

   Vacant and undeveloped lands, etc.

METHODS OF FLOW MEASUREMENT

Calculating the Area (a) of the Cross Section of a Circular Pipe Flowing Partially Full

D = Depth of water a = area of water in partially filled pipe
d = diameter of the pipe Ta = Tabulated Value Then a = Ta*d2

D/d	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0013	0.0037	0.0069	0.0105	0.0147	0.0192	0.0242	0.0294	0.0350
0.1	0.0409	0.0470	0.0534	0.0600	0.0668	0.0739	0.0817	0.0885	0.0951	0.1039
0.2	0.1118	0.1199	0.1281	0.1365	0.1440	0.1535	0.1623	0.1711	0.1800	0.1890
0.3	0.1982	0.2074	0.2187	0.2280	0.2355	0.2450	0.2540	0.2642	0.2780	0.2836
0.4	0.2934	0.3032	0.3130	0.3220	0.3328	0.3428	0.3527	0.3627	0.3727	0.3827
0.5	0.3980	0.4030	0.4130	0.4230	0.4330	0.4430	0.4520	0.4620	0.4720	0.4820
0.6	0.4920	0.5020	0.5120	0.5210	0.5310	0.5400	0.5500	0.5590	0.5690	0.5780
0.7	0.5870	0.5960	0.6050	0.6140	0.6230	0.6320	0.6400	0.6490	0.6570	0.6660
0.8	0.6740	0.6810	0.6890	0.6970	0.7040	0.7120	0.7190	0.7250	0.7320	0.7360
0.9	0.7450	0.7500	0.7560	0.7610	0.7660	0.7710	0.7750	0.7790	0.7820	0.7840

AREA x VELOCITY

(CREEK/CHANNEL METHOD)

a. Measure the width, depth, and velocity of the water.

b. Convert each value to a common unit (i.e. all measurements converted to cm, ft, or in.).

c. Multiply the width * depth * velocity to determine flow.

d. Multiply the flow by 0.8 for creek measurements –or-- 0.9 for concrete channel measurements to account for channel roughness.

e. The results if measured in

a. Ft = Ft^3/sec
b. cm = cm^3/sec (mL/sec)
c. in = in^3/sec

f. Convert to desired value.

TIME REQUIRED TO FILL A KNOWN VOLUME

(FILL A BOTTLE METHOD)

1. Determine volume/capacity of the sample bottle.
2. Measure time required to fill the bottle.
3. Flow will be determined by initial volume units:
   - mL/s
   - oz/s
4. Convert to desired value.

AREA x VELOCITY

(PARTIALLY FILLED PIPE)

g. All measurement must be converted to a common unit before calculation (ft, in, or cm).

h. Let D = water depth.

i. Let d = *inside* pipe diameter

j. Calculate D/d.

k. Find the tabulated (Ta) value on the partially filled pipe formula chart above using the D/d value. (i.e. if D/d = 0.263 then Ta =.1623).

l. Find the area using the formula $a = Ta*d^2$.

m. Multiply area (a) by the water velocity.

n. Convert to desired value.

SAE / Metric Unit Conversion

0.083 ft	=	1 in	=	2.54 cm
0.1337 ft^3	=	**1 gal**	==	**128 oz3.785 L**
0.0078 gal	=	**1 oz**	=	**.0011 ft^3**
1000 cm^3	=	**1 L**	=	**1000 mL**

Based on dry weather field screening and analytical results, follow-up investigations may be necessary to identify and eliminate pollutant sources. In order to determine whether a source investigation is necessary, the following three methods will be employed: (1) Numeric action levels; (2) Statistical confidence intervals; and (3) Best professional judgment. All three approaches are described in detail below and presented in Table 8-4. Table 8-4 reflects the current action level table that is being developed regionally by the monitoring workgroup. This table will be updated as changes are made at the regional level.

1. Numeric action levels

   Numeric action levels will be used as the primary approach for interpreting pH, orthophosphate, nitrate, ammonia, conductivity or TDS, MBAS, oil and grease, Diazinon, and Chlorpyrifos analytical results (Table 8-4). If these action levels are exceeded, then a source identification investigation will be initiated unless best professional judgment indicates otherwise. Dissolved trace metals (Cd, Cu, Pb, and Zn) are compared to the California Toxics Rule 1-hour criteria in combination with hardness levels.

2. Statistical confidence interval

   Identification of highly elevated concentrations using confidence intervals is the primary approach for interpreting total and fecal coliform bacteria and enterococcus data. Dry weather data from all copermittees is being combined so that confidence intervals and other statistical analyses can be completed in March 2003. The adopted action level table will be used during the 2003 dry weather testing.

3. Best professional judgment (BPJ)

   Best professional judgment will be utilized as the primary approach for interpreting turbidity and water temperature data, and the secondary approach for interpreting the results of all other field and laboratory analyses. BPJ is encouraged by the monitoring workgroup as it allows the use of all monitoring tools (observations, field screening, analytical data, discharge, site characteristics, etc.) to determine if conditions warrant follow-up.

When the results of field screening sampling exceed the action levels or confidence intervals presented in Table 8-4, the City will initially confirm the results by resampling. Field analytical results will be confirmed by resampling within between 4 and 24 hours after the initial sample and source investigation will begin thereafter. When the results of a laboratory analytical sample exceed the action levels or confidence intervals, source investigation will begin as soon as possible and another sample will be collected and analyzed to confirm initial results. If visual and /or analytical evidence of gross contamination is present at a site (e.g., substantial petroleum sheen, extremely high ammonia concentration, evidence of a sewage release) then an immediate source identification investigation will be initiated.

The City of Carlsbad proposes to address 100% of reported illicit discharges and connections for investigation, enforcement, and reporting although a performance goal of 95% is expected to meet Permit requirements. The 95% performance goal allows for accounting of investigations "in-progress" where the source was has not been identified at the end of the reporting year. Open investigations that cannot be resolved after 90 days due to the lack of additional information or repeat of the incident or event will be closed. Staff may use the information, if a repeat incident is found at a later date.

Sources of complaints or referrals of illicit connections or illegal discharges include:

- Observations (during routine and non-routine inspections of commercial/industrial businesses),
- Public Reporting (known or suspected discharges), and
- Detections (Dry Weather Monitoring Program).

The process of investigation will follow the diagram provided at the end of this Section and follows the general approach below. To determine whether a discharge or connection is illicit, the City will attempt to identify the source. Determining the source will follow the process outlined below:

- Search the area for any physical, chemical, or biological signs of the reported or field incident
- Explore the possible scenarios of how the material or disturbance occurred
- Identify potential sources and verify origin
- Examine the drainage system area for other possibilities
- Inquire to available businesses or witnesses what had occurred.
- Document findings and information.

Based on each case of observed, reported, or verified detected illicit discharge location, pollutants, concentrations, and specific impacts, the City of Carlsbad will identify and address the following:

1. Evaluation of Discharge
   - Discharge volume,
   - Frequency and abundance, and
   - Duration of Discharge
   - Determine Corrective Action

2. Responsible City Department or Agency
   - Efficient and comprehensive follow-up
   - Develop and refine routines and strategies

3. Documentation
   - Record applicable and pertinent information

4. Information Storage
   - Viable, long-term information retrieval

5. Education and Training
   - Use experience and eliminate recidivism (repeat offenses)
   - Present number of reported, verified, and eliminated incidents in the Annual Report.